



**ASTRO® Spectra® Radio
Siren/Public Address
(HLN1439B)
For ASTRO Digital Spectra
Special Applications
Radio Accessory**

Instruction Manual

Foreword

The information contained in this manual supplement relates to the ASTRO™ Digital Spectra® Siren/Public Address Accessory, unless otherwise specified. This manual provides sufficient information to enable service shop personnel to troubleshoot and repair an ASTRO Spectra Siren/Public Address Accessory to the component level.

Safety Information

Before operating an ASTRO Spectra Siren/Public Address Accessory, please read the “User Safety, Training, and General Information” section in the front of this manual and the safety information in your accompanying user manual.

Warnings, Cautions, and Notes

Throughout the text in this publication, you will notice the use of Warnings, Cautions and Notes. These notations are used to emphasize that safety hazards exist and care must be taken or observed.



WARNING

An operational procedure, practice or condition, etc., which may result in injury or death if not carefully observed.



Caution

An operational procedure, practice or condition, etc., which may result in damage to the equipment if not carefully observed.

NOTE: An operational procedure, practice or condition, etc., which is essential to emphasize.

Manual Revisions

Changes which occur after this manual is printed are described in “FMRs.” These FMRs provide complete information on changes, including pertinent parts list data.

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User Safety, Training, and General Information

READ THIS IMPORTANT INFORMATION ON SAFE AND EFFICIENT OPERATION BEFORE INSTALLING AND USING YOUR MOTOROLA MOBILE TWO-WAY RADIO IN A VEHICLE OR AS A CONTROL STATION.

Compliance with RF Energy Exposure Standards

Your Motorola two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. **This radio complies with the IEEE (FCC) and ICNIRP exposure limits at duty cycles of up to 50% talk-50% listen and should be used for occupational use only.** In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

Your Motorola two-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47CFR part 2 sub-part J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2001 (applicable to wireless phones only)
- ANATEL, Brasil Regulatory Authority, Resolution 256 (April 11, 2001) "additional requirements for SMR, cellular and PCS product certification."

Operational Instructions and Training Guidelines

To ensure optimal performance and compliance with the RF energy exposure limits in the above standards and guidelines, users should transmit no more than 50% of the time and always adhere to the following procedures:

Transmit and Receive

- **To transmit (talk), push the Push-To-Talk (PTT) button; to receive, release the PTT button.**
- **Transmit only when people outside the vehicle are at least the minimum lateral distance away, as shown in Table 1, from a properly installed, externally-mounted antenna.**

Table 1 lists the minimum lateral distance for bystanders in an uncontrolled environment from the transmitting antenna at several different ranges of rated radio power for mobile radios installed in a vehicle.

Table 1. Rated Power and Lateral Distance

Rated Power of Vehicle-Installed Mobile Two-way Radio	Minimum Lateral Distance from Transmitting Antenna
Less than 7 watts	8 inches (20 centimeters)
7 to 15 watts	1 foot (30 centimeters)
16 to 50 watts	2 feet (60 centimeters)
51 to 110 watts	3 feet (90 centimeters)

Mobile Antennas

- **Install antennas at the center of the roof or the center of the trunk deck. These mobile antenna installation guidelines are limited to metal body vehicles.**
- **The antenna installation must additionally be in accordance with:**
 - a. The requirements of the antenna manufacturer/supplier
 - b. Instructions in the Radio Installation Manual
- **Use only Motorola approved supplied antenna or Motorola approved replacement antenna.** Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

Approved Accessories

For a list of Motorola approved antennas see the appendix of this user manual.

Fixed Site Antennas

If mobile radio equipment is installed at a fixed location and operated as a control station or as a fixed unit, the antenna installation must comply with the following requirements in order to ensure optimal performance and compliance with the RF energy exposure limits in the above standards and guidelines.

- The antenna should be mounted outside the building on the roof or a tower if at all possible.
- As with all fixed site antenna installations, it is the responsibility of the licensee to manage the site in accordance with applicable regulatory requirements and may require additional compliance actions such as site survey measurements, signage, and site access restrictions in order to insure that exposure limits are not exceeded.

Electro-magnetic Interference/Compatibility

NOTE: Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility. It may be necessary to conduct compatibility testing to determine if any electronic equipment used in or around vehicles or near fixed antenna sites is sensitive to external RF energy and if any procedures need to be followed to eliminate or mitigate the potential for interaction between the radio transmitter and the equipment or device.

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, **turn off your radio in any facility where posted notices instruct you to do so.** Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.

Vehicles

To avoid possible interaction between the radio transmitter and any vehicle electronic control modules, for example, ABS, engine, or transmission controls, we recommend that the radio be installed by an experienced installer and that the following precautions be used when installing the radio:

1. Refer to any manufacturers instructions or other technical bulletins or recommendations on radio installation.
2. Before installing the radio, determine the location of the electronic control modules and their harnesses in the vehicle.
3. Route all radio wiring, including the antenna transmission line, as far away as possible from the electronic control units and associated wiring.

Driver Safety

Check the laws and regulations on the use of radios in the area where you drive. Always obey them.

When using your radio while driving, please:

- Give full attention to driving and to the road.
- Pull off the road and park before making or answering a call if driving conditions so require.

Operational Warnings



For Vehicles With an Air Bag

Do not place a portable or mobile radio in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a radio is placed in the air bag deployment area and the air bag inflates, the radio may be propelled with great force and cause serious injury to occupants of the vehicle.

Potentially Explosive Atmospheres

Turn off your radio prior to entering any area with a potentially explosive atmosphere. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

The areas with potentially explosive atmospheres referred to above include fueling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust or metal powders, and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often but not always posted.

Blasting Caps and Blasting Areas

To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn off two-way radio." Obey all signs and instructions.

For radios installed in vehicles fuelled by liquefied petroleum gas, refer to the (U.S.) National Fire Protection Association standard, NFPA 58, for storage, handling, and/ or container information. For a copy of the LP-gas standard, NFPA 58, contact the National Fire Protection Association, One Battery Park, Quincy, MA.

Chapter 1 Introduction

1.1 Siren/PA Description

The Siren/Public Address (PA) Accessory is used with ASTRO Spectra radio systems.

The Siren/PA is an external accessory that generates waveforms, amplifying signals to create Siren tones and public announcements. It can deliver 65, 75, or 100 watts of Siren power to an 11 ohm speaker, or 130 watts to dual 11 ohm speakers. In PA mode, it can deliver 50 watts of audio power.

This accessory consists of the Siren/PA unit and the connection cables that connect the Siren/PA to your radio system. An optional control unit is also available.

Depending on how your system is configured, the Siren/PA unit (which usually resides in the trunk of the car) is connected to your radio system using a cable and operated in one of four ways:

- from the mobile radio control head
- from a Direct Entry Keyboard (DEK) connected to the control head (supports W4, W5, W7, or W9 control heads)
- from a DEK connected directly to the Siren/PA unit (supports the W3 radio control head only)
- from a switchbox connected directly to the Siren/PA unit (supports all control heads).

Some Siren/PA operational features may be altered to suit your preferences by programming your radio using Radio Service Software (RSS). A summary of the available features of each Siren/PA configuration is shown in [Table 1-1](#).

Table 1-1. Siren/PA Features

Feature	Control from radio control head	Control from direct DEK	Control from switchbox
Wail/Yelp/Hi-Lo tones	YES	YES	YES
“Airhorn” tone	YES	YES	no
Siren Manual tones	YES	YES	no
Horn-ring override	YES	YES	no
Public Address	YES	YES	YES
External Radio	YES	YES	no
PA volume control	YES	YES	YES
Siren Power control	automatic	automatic	automatic
Speaker short protection	YES	YES	YES
Siren State Retained (while radio off)	YES	YES	YES
Programmable parameters (with radio codeplug)	YES	YES	YES
Power-up self check	YES	YES	YES
Record Audio Jack	no	no	YES

Table 1-2. Performance Specifications Electrical Characteristics

Parameter	Minimum	Typical	Maximum	Conditions (See Notes)
Public Address Audio Distortion			10%	@ 50 watts output with 80mV, 1kHz signal
Public Address Rated Audio	50 watts			80mV 1kHz signal input
Current Drain			13 amps	Siren tones ON
Frequency Response		No more than ± 3 dB variation No more than ± 4 dB variation		f = 200Hz to f = 8kHz; ref: 80mV, 1kHz signal f = 9kHz to f = 10kHz; ref: 80mV, 1kHz signal
Temperature Range	-30°C		60°C	

NOTE: All tests to be conducted at 13.8 ± 0.05 volts, with an $11 \text{ ohm} \pm 10\%$ load connected to a 100 watt speaker output, unless otherwise indicated.

Input Signal Sensitivity required for rated public address output is 80 mV RMS ± 3 dB.

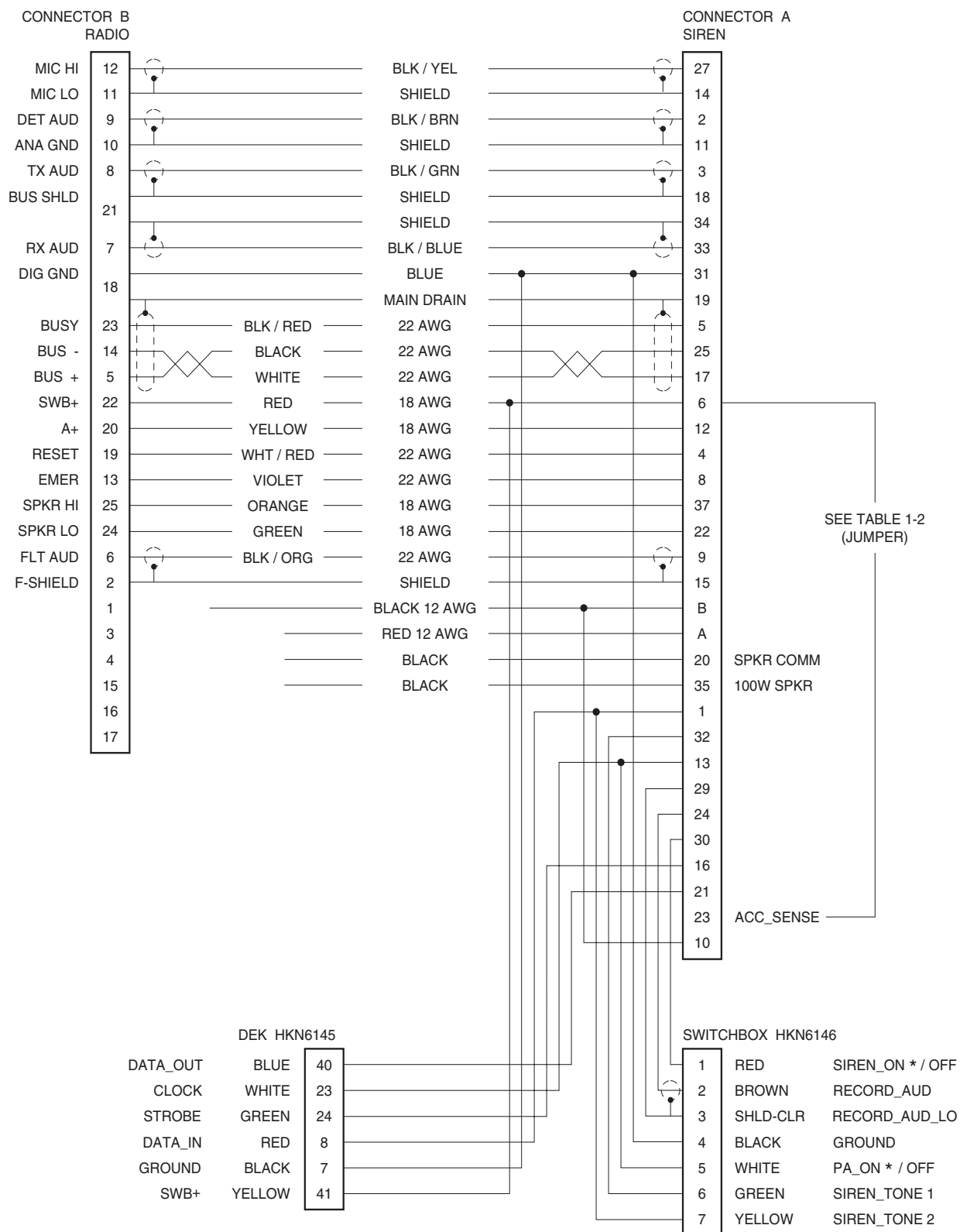
Table 1-3. Frequency Limits for Siren Tones

Operating Mode	Frequency Minimum	Frequency Maximum	Sweep Period
Off	0	0	N/A
Wail	526 Hz	1504 Hz	5.25 sec/cycle
Yelp	526 Hz	1504 Hz	310 mSec/cycle
Hi-Lo	525 Hz	700 Hz	1.5 sec/cycle
Man ^a	Note ^a	1504 Hz	Note ^b
Ar Hn	N/A	N/A	14.15 mSec/cycle

a. Data shown for Man Wail mode. In Man Yelp mode, specifications are the same as for Yelp; Man Ar Hn (Airhorn) specifications are the same as for Ar Hn.

b. Goes down to 526 Hz, then mutes; no tolerance specified. Manual sweep period depends on which manual mode is selected. In Manual Wail mode, no sweep period applies since the duration of the wail is controlled by the operator. In the Manual Yelp mode, there are either no tones (horn-ring not pressed) or there are yelp tones (horn-ring pressed) -- a similar argument applies to the Manual Ar Hn.

1.2 Cabling Diagram



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Chapter 2 Operation

2.1 Siren/PA Operation

2.1.1 Control Unit

Depending on the installed configuration, the Siren/PA may be controlled by buttons on the control head, DEK, or by toggles on the switchbox.

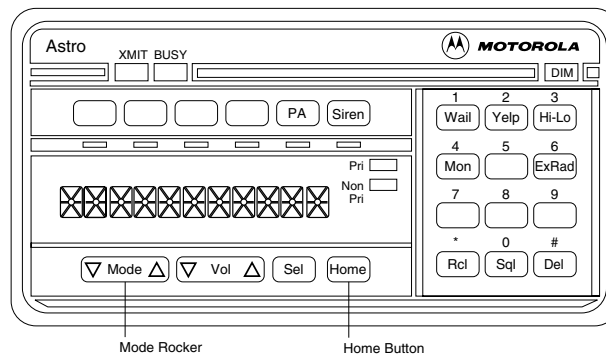


Figure 2-1. Typical ASTRO Control Head with Siren/PA

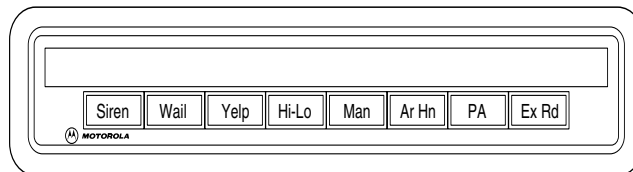


Figure 2-2. Direct Entry Keyboard (DEK)



63L07992D43-O

Figure 2-3. Switchbox

2.2 Public Address Operation

The Public Address feature broadcasts and amplifies the user's voice over the Siren speaker.

After the PA feature is activated, the control head display will temporarily show the current PA volume setting. Use the [Vol] rocker button or rotary knob (depending on the control head used) to alter the PA volume level. Changing the PA volume using a rocker button does not change the radio's volume setting. Adjusting the PA volume with a rotary knob will change the radio's volume setting based on the position of the knob.

To use the Public Address, press the **Push-To-Talk (PTT)** button and speak into the microphone. The user's voice will be amplified and broadcast over the Siren speaker. Pressing the [PTT] while the PA feature is activated will not cause the radio to transmit.

If the Public Address and Siren options are both on at the same time, pressing the PTT will override any Siren function. Any Siren tone or incoming radio signals (if in External Radio mode) will be muted abruptly to give the Public Address priority operation.

2.2.1 Control Head/DEK

Momentarily press the [PA] button to activate the Public Address function. The corresponding light-emitting diode (LED) will illuminate. To turn off the Public Address, momentarily press the [PA] button again.

2.2.2 Switchbox

Move the PA toggle to the [PA On] position to activate the Public Address function. To turn off the PA, move the PA toggle to the [PA Off] position.

2.3 Siren Tone Operation

Wail, Yelp and Hi-Lo Siren tones are broadcast over the Siren speaker. The Siren function toggles the broadcasting of the Siren tones.

The Siren tones may be selected or changed at any time (the Siren function does not have to be activated).

When the Siren function is activated, the control head display will temporarily show the selected Siren tone. In addition, any time the Siren tone is changed the display will briefly show the newly selected tone (even if the Siren function is Off).

2.3.1 Control Head/DEK

To turn on the Siren function, momentarily press the [Siren] button. To broadcast the desired tone, momentarily press the [Wail], [Yelp], or [Hi-Lo] buttons. The corresponding LEDs will illuminate. To turn off the tone, momentarily press the [Siren] button again.

2.3.2 Switchbox

To turn on the Siren function, move the Siren toggle to the [Siren On] position. To broadcast the desired tone, move the tone toggle to the [Wail], [Yelp], or [Hi-Lo] position as appropriate. To turn off the Siren, move the Siren toggle to the [Siren Off] position.

If the Horn-Ring feature is connected, the Siren tone may be changed by pressing the vehicle's Horn-Ring (while broadcasting a Siren tone). The operation of the Horn-Ring feature is shown in [Table 2-1](#).

Table 2-1. Horn-Ring Operation

Selected Tone	Changes to	Note
Wail	Yelp	Press and release the Horn-Ring to change to Yelp tone. Press the Horn-Ring again to return to Wail tone.
Yelp	Ar Hn	Press the Horn-Ring to create the airhorn tone. Airhorn sounds as long as the Horn-Ring is pressed. Release the Horn-Ring to return to Yelp tone.
Hi-Lo	Wail	Press and release the Horn-Ring to change to Wail tone. Press the Horn-Ring again to return to Hi-Lo tone.

2.4 External Radio Operation

The External Radio feature amplifies and broadcasts incoming radio messages over the Siren speaker, allowing radio communications to be heard outside the vehicle.

2.4.1 Control Head/DEK

To enable the External Radio feature, turn the Siren function on by momentarily pressing the [Siren] button. Then, select the External Radio function by pressing the [Ex Rd] button. The corresponding LEDs will illuminate. To turn off the External Radio press the [Siren] button again (to turn off the Siren function), or select a different Siren function (Wail, Yelp, etc...).

The External Radio volume can be adjusted with the radio's [Vol] rocker button. Changing the External Radio volume using a rocker button (depending on the control head used) does not change the radio's volume setting. Adjusting the External Radio volume with a rotary knob (depending on the control head used) will change the radio's volume setting based on the position of the knob.

2.4.2 Switchbox

The External Radio feature is not available with a switchbox.

2.5 Record Audio Jack Operation

The Record Audio Jack feature allows you to record incoming radio signals with a switchbox configuration.



Caution

To avoid damaging the tape recorder, make sure the volume level is at an acceptable level (neither too low nor too high).

Connect the tape recorder to the Audio Jack on the switchbox to receive the incoming radio messages.

2.6 Airhorn Operation

The Airhorn feature -- available with the Control Head and DEK configurations -- broadcasts an airhorn tone over the Siren speaker. To broadcast the Airhorn, momentarily press the [Ar Hn] button. The LED will illuminate. To turn off the Airhorn, press the [Ar Hn] button again.

2.7 Manual Operation

The Manual function -- available with the Control Head and DEK configurations -- allows the Horn-Ring to activate a Siren tone.

To enable the Siren tone to be generated via the Horn-Ring, press the [Man] and [Siren] buttons. The corresponding LEDs will illuminate. Press the Horn-Ring to broadcast the pre-set tone (tones are programmed in the RSS, the default tone is Wail). The Horn-Ring may be programmed to generate the following tones:

- Manual Wail -- Pressing the Horn-Ring activates a rising Wail that peaks at 1500 Hz and continues as long as the Horn-Ring is held. When the Horn-Ring is released, the Wail tone falls until the tone is muted.
- Manual Yelp -- Pressing the Horn-Ring activates a Yelp tone that continues as long as the Horn-Ring is held. When the Horn-Ring is released, the tone immediately mutes.
- Manual Airhorn -- Pressing the Horn-Ring activates an airhorn sound that continues as long as the Horn-Ring is held. When the Horn-Ring is released, the tone immediately mutes.

2.8 Speaker Protection Alert

2.8.1 Speaker Short Detection

When a short exists, the system performs a routine to “protect” itself from further harm. If a speaker short occurs, any audio broadcast (Siren functions, PA audio) will be stopped. The Control Head display will read “SPKR SHORT.” The Siren/PA unit detects when the problem is corrected and returns to its previous operation.



Caution

In order for this feature to operate correctly, use only the following Motorola approved speaker kits: TDN6251, TDN6252, TDN6253, and TDN6254. The use of any other speakers may cause unreliable operation of this feature and prevent proper operation of the Siren/PA.

2.9 Power-Up Feature

2.9.1 Siren State

The Siren/PA Accessory powers-up in one of two ways, a Warm Start (battery power was not removed) or a Cold Start (battery power was removed). Depending on the power-up routine and the accessory configuration (DEK or Switchbox) different operations will be initialized upon power-up.

2.9.2 DEK

In a Warm Start with a DEK, the Siren will power-up with the PA Volume, Siren tone, and Siren On/Off in their previously selected state at power-down and with the PA Off.

NOTE: In a Warm Start with the DEK, whether or not the Siren On/Off powers-up in its previous state is programmable in the RSS. The feature can be disabled, causing the Siren/PA to always power-up with Siren Off.

In a Cold Start with a DEK, the Siren will power-up with default PA Volume, Wail tone, PA Off, and Siren Off.

2.9.3 Switchbox

For a Warm Start with the Switchbox, the Siren On/Off, PA On/Off, and Siren tone are selected by the position of their toggles and the PA Volume will power-up with its previously selected PA Volume at power-down. In a Cold Start the former holds true except that PA Volume will power-up with its default setting.

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Chapter 3 Theory of Operation

3.1 Overview

The Siren/PA consists of two main functional blocks: A high-powered amplifier and a microprocessor that controls the operation of the Siren and generates the Siren tones.

Control for the Siren/PA is derived either from commands sent via a serial interconnect from the radio control head or from devices connected directly to the Siren/PA. When a Switchbox is connected to the Siren/PA, its controls are directly interpreted by the Siren microprocessor. When a DEK is connected to the Siren/PA, button presses are conveyed to the radio. The radio interprets them and provides commands to the Siren (this is to allow the RSS to define the button functions, by programming the radio codeplug).

Siren tones are generated directly by the Siren/PA, while Mic and External Radio audio are provided from the radio.

3.2 Microprocessor and Control Interface

The microprocessor is a MC68HC711E9CFN2 type. This processor has internal memory, and operates in a single chip mode. The microprocessor is powered-on and runs its program continuously. In normal operation, it senses the control head On/Off switch being turned on by a transition (from 0 to 5V) on pin 18, XIRQ; this causes the microprocessor to synchronize its operation with the radio. The microprocessor can be reset to restart its program in certain circumstances, this is done by a low signal on pin 19, RESET. The RESET signal can be generated from the radio via P1-4; or by low or absent supply voltage, via a voltage sense line from the regulator IC U108, pin 5.

As long as battery power is connected, the microprocessor preserves the contents of RAM using UNSW 5V. A power-down sequence is initiated when the control head is switched OFF, removing Switched 5V. The XIRQ microprocessor input is active when Switched 5V is not present initiating the XIRQ interrupt power-down routine. When the Siren/PA is powered-down the initialization routine detects if the microprocessor's RAM was preserved. The microprocessor is then put into a STOP state to reduce current drain. When the Siren/PA is powered-up, the RAM is preserved and a Warm Start will be executed, restoring the Siren/PA to its previous state.

If battery power is removed from the Siren/PA the contents of RAM are cleared. This occurrence is detected by the initialization routine. In this case a Cold Start is executed, resulting with the Siren/PA returning to its default state.

NOTE: The microprocessor timing is controlled by the crystal Y101. This circuit is very sensitive, and probing it is likely to stop or reset the microprocessor operation.

3.2.1 Bus Interface

The microprocessor can receive control information either from the radio, the DEK, or the Switchbox. To communicate with the radio, a serial interface is used. The serial interface consists of a differential pair of data lines (BUS+ and BUS-) running at 9600 bps and a control line (BUSY). Data is received from the BUS+ and BUS- lines by U100-1, a differential receiver, and provided to the radio's receive port (RXD, pin 20). BUSY is monitored on PA2, pin 32 (buffered by Q103). This line will go low shortly before data appears on BUS+ and BUS-, and go high shortly after the end of data. When the microprocessor transmits data, it is output on TXD (pin 21), and driven onto BUS- by Q102. The signal is also inverted by U101-1, and driven onto BUS+ by Q101. Note that the microprocessor monitors its own output via U100-1. The processor drives BUSY, while outputting data, from PA6 via buffer Q104.

3.2.2 DEK/Switchbox Interface

The microprocessor determines if a DEK or a Switchbox is connected by the ACC_SENSE line, which will be high when a Switchbox is connected. This sense line is inverted and buffered by Q110, and provided to the microprocessor at pin 44. It is also used to switch analog gates U106-1 and U106-2 and to route either the DEK or Switchbox signals. This allows for P1-1 and P1-13 connector pins to be used for both interfaces.

The DEK interface is a serial interface. Every 25 ms the microprocessor will output new annunciator and VIP information to the DEK, and simultaneously read in button and VIP data. To do this, the microprocessor first makes a high-to-low transition on the STROBE line (P1-16) to latch the data to be read from the DEK. The microprocessor then generates a CLOCK on pin 24, which is routed through Q111 and U106-1 to the DEK connector at P1-13 CLOCK. At the same time, data to the DEK will be output at pin 23, via Q108 to P1-21 DATA_OUT. The clock will also cause the DEK to output its data to P1-1 DATA_IN, from which it passes through U106-2 and Q112 to the microprocessor at pin 20. Following a data transfer, the microprocessor will then assert the STROBE output (from pin 25, via Q109).

The Switchbox interface is a parallel interface. The position of the Siren On/Off and PA On/Off toggles are read directly by the microprocessor, the Siren On/Off at pin 47, and the PA On/Off, via U106-1, at pin 49. The Siren tone switch is binary coded in the Switchbox, and is read through the two inputs SIREN_TONE1 and SIREN_TONE2 (pin 43, and, via U106-2, pin 45 respectively). The selected tone is encoded as shown in [Table 3-1](#).

Table 3-1. Siren Tones

Siren Tone 1	Siren Tone 2	Selected Tone
High	High	Yelp
High	Low	Hi-Lo
Low	High	Wail
Low	Low	Wail (Invalid)

3.3 Low-Level Audio

Three sources of audio are handled by the Siren: Mic audio in PA mode, filtered audio in Ex Rd mode, and the Siren tone. MIC_HI and DET_AUDIO come from the radio, while Siren tones are generated by the microprocessor. MIC_HI audio from the radio is coupled into the Siren through a transformer to provide common mode noise rejection.

The microprocessor selects the audio source by enabling either U103-1 or U103-4, or by generating a Siren tone on the PA7 output, buffered through Q100. All three sources are summed by Op Amp U102-1. The summing resistors R118, R120, and R122 are chosen to provide the appropriate relative levels for the three sources.

The composite audio is passed to the volume control IC, which is actually a variable gain amp. The gain of this amplifier is set by a serial data string output by the microprocessor.

Audio from the volume control IC is gated by U103-3. U107 provides the final level setting to the FET driver.

3.4 High Level Audio

The power amplifier stage of the Siren/PA is a Push/Pull Class B amplifier, employing FET transistors (Q115 and Q116). Audio from the low-level stage is buffered by amp U107-1, and an inverted signal is created by amp U107-2. These two signals are provided to the FET drivers, U107-3 and U107-4.

The FET driver takes the audio signal on the non-inverting input and a feedback signal on the inverting input. The output of the driver, which is the gate signal to the FET, will adjust to make the feedback voltage track the audio input. Since the feedback voltage is developed across the FET source resistor R220 and transistor Q118, the circuit causes the current flow through the FET to vary proportionally to the audio input voltage. Notice that this circuit can only cause a positive current flow and will result in the FET turning off during the negative half cycle. An output signal covering the entire cycle is created by using Q115 for the positive half cycle and Q116 (driven by the inverted input) for the negative half cycle.

The drains of Q115 and Q116 are connected to the primaries of T100, whose center is connected to the A+ supply. The windings are phased such that the current in Q115's primary develops a positive half cycle in the secondary, and the current in Q116's primary causes a negative half cycle in the secondary. T100 serves as a step-up transformer to convert the low-voltage, high current signal from the FET's to a high-voltage, low current signal to the load.

The transformer has three output taps, allowing different power levels to be provided. The current in the transformer primary is independent of the impedance. Changing the impedance of the primary by connecting the load to different secondary taps directly determines the power developed in the primary, and thus presented to the load.

R189 and C181 are connected across the transformer secondary as a snubber. This connection prevents very high voltages from developing when no load is connected.

The FET drive circuit chosen is essentially independent of the FET characteristics. This avoids the need for any compensation for thermal changes in the FET and allows easy substitution of alternate parts if the current FET should become unavailable.

3.5 Power

Power to the Siren is provided directly from the vehicle battery (A+) and from the radio (SW B+).

A+ directly supplies the audio PA final stage and its drivers. U109 also draws power from A+ to generate UNSW 5V, which is used only to power the microprocessor.

Due to the high current load presented by the audio PA while in operation, A+ has a large filter capacitor. This filtering prevents audio riding on the supply from causing unwanted feedback and distortion in the low-level audio circuits.

SW B+ supplies power to the U104, U108 and Op Amp U107. The U104, an adjustable regulator, generates 9.6V for the low-level audio circuits. A resistive divider off this source is used to generate the half-supply reference, Vag.

U108 generates 5V for the logic and bus interface circuits. U108 also generates the low-voltage reset signal to the microprocessor.

The Op Amp U107 supply is provided with extra filtering through R217 and C202 to isolate it from the current loads of the final amp.

A single ground reference is used throughout the design. This avoids problems of unequal ground references, loops, and noise coupling sometimes seen in split-ground designs. The layout places the high current portion of the circuit with the shortest, heaviest ground path possible.

3.6 Power Control and Speaker Short Detection

The amplifier operates in clip while generating Siren tones. Therefore, it is necessary to provide compensation for changes in supply voltage. This is accomplished by monitoring the voltage developed on an extra secondary winding of the transformer. This voltage is integrated by D104, R194, and C187, and applied to two comparators, U105-2 and U105-3. Reference voltages are developed by the chain of R144, VR115, R192, D102, D103, R193 and R146; with hysteresis added by R141 and R142. The comparator outputs are taken to the microprocessor.

When the Siren is generating its nominal 100W output, the output of U105-3 is high, and the output of U105-2 is low. If the output power should rise, U105-3 will switch to a low, and the microprocessor will respond by decreasing the gain of the volume control IC U111. Similarly, if the output power should sink below the nominal value, U105-2 will switch to a high, and the microprocessor will respond by increasing the gain of the volume control IC.

The power control circuit does not function in PA or Ex Rd modes because the audio signal will not drive the amplifier sufficiently into clip to have a significant effect as supply voltage changes.

Similarly, because the Siren tones put the amplifier in clip, large currents can flow through the FET's with no load impedance reflected through the transformer. To avoid damage, the voltage across the source resistor R220 and transistor Q118, is monitored by comparator U105-1. R139 and R140 set a threshold of approximately 18 amps through the transformer.

When the speaker load current exceeds the threshold of 18 amps a speaker short will occur. The output of the comparator will switch to high and the microprocessor will respond by stopping the Siren tone and generating the "SPKR SHORT" display. The processor periodically (approximately 1.33 seconds) checks the condition by re-enabling the amplifier and sensing the current. When the short is fixed the speaker short conditions are cleared and Siren/PA returns to its previous operation. Otherwise, the amplifier is switched back OFF for another 1.33 seconds.

Chapter 4 Siren/PA Configuration/Programming

The Siren/PA is shipped pre-wired for 100W operation. It can be rewired for 65W, 75W, or 130W power levels.

To change to another power level, perform the following:

1. Open the Siren/PA connector cover to gain access to the two-connector speaker leads. Do not change the speaker common lead (pin 20). The other lead is connected to pin 35 (for 100W operation).
2. Using an appropriate pin removal tool, extract pin 35 and move it to one of the following pin locations:
 - pin location 36 for 75W operation
 - pin location 28 for 65W or 130W operation
3. For 65W or 75W operation, no further changes are required. Reassemble the connector.
4. For 130W operation, you must parallel two 11 Ω speakers, each rated at 65W minimum. Proper phasing of the two speakers is important--when connecting two speakers in parallel, wire similar speaker terminals together to ensure maximum loudness and prevent "deadspots." For example, if the terminals are marked "1" and "2", connect the terminals marked "1" together and connect those wires to one speaker lead. Connect the terminals marked "2" together and connect those wires to the other speaker lead.



Caution

Before continuing, remember that under a high-line supply condition (16.6V), up to 30% more power will go to the speaker(s) after reconfiguring for 130W operation. Do this only when your PA speakers are capable of handling the extra power.

5. When the Siren/PA is configured for dual speaker, 130W operation, it is necessary to remove a resistor and move two jumpers to set the correct power level. Remove the Siren/PA cover, and locate resistor R219 (0 ohm). This resistor should be removed for 130W operation. Locate jumpers JU100 and JU101. These jumpers should be installed for 130W operation.
6. Close and reconnect the Siren/PA connector cover.

NOTE: Jumpers JU100 and JU101 do not affect the Siren output level. JU100 and JU101 compensate for the lower speaker load and the two speakers in parallel, by decreasing the gain U102-1. JU100 affects the radio PA level and JU101 affects the PA audio level.

Pin locations for various power level configurations are listed in [Table 4-1](#).

Table 4-1. Power Level Configurations

	Pin location of speaker leads	R219	JU100/JU101
65W	20,28	IN	Across pins A and B
75W	20,36	IN	Across pins A and B
100W	20,35	IN	Across pins A and B
130W	20,28	OUT	Across pins B and C

The configuration of the JU102 jumper enables the W3 control head to turn the Siren DEK lighting ON and OFF. For possible configurations, refer to [Table 4-2](#).

Table 4-2. Siren DEK LED/Back Light Control Configuration

Models	JU102 Placement	Function
W3	Across pins A and B	Control head *[Light] button has no effect on Siren DEK
W3	Across pins B and C	Control head *[Light] button controls Siren DEK lighting

*[Light] button is programmable in the RSS.

Chapter 5 RSS Programming

The Radio Service Software (RSS) stores programmed options in the Radio's codeplug. The RSS is preprogrammed with default settings at the factory but may be modified to suit your needs. There are two primary screens in the RSS for editing Siren/PA options, More Radio Wide Options and Siren and PA Options.

Log in to RSS and press F4, then F3, then F9 to access the More Radio Wide Options screen.

MOTOROLA Radio Service Software ASTRO MOB LAB Model: D04UJH9PW3AN MAIN:CHANGE/VIEW:CONFIG:MORE OPTIONS	Use UP/DOWN Arrows to Select Choice.								
MORE RADIO WIDE OPTIONS ----- Siren Option.....Siren/PA TRC Option.....Disabled Multi Radio System..Disabled									
F1 HELP	F2 SIREN/PA OPTIONS	F3	F4	F5	F6	F7	F8	F9	F10 EXIT

Figure 5-1. "More Radio Wide Options" Change Screen

Under the Siren Option field, the Siren and PA option must be selected in order to modify the unit's RSS options. The Tab key moves the cursor through the different fields and the up/down arrows select the available options.

Press F2 to go to the Siren and PA Options programmable screen.

MOTOROLA Radio Service Software ASTRO MOB LAB Model: D04UJH9PW3AN ...MORE OPTIONS:SIREN?PA OPTIONS	Use UP/DOWN Arrows to Select Choice.												
SIREN AND PA OPTIONS ----- <table><tr><td>Public Address</td><td>Siren</td></tr><tr><td>Options Audio Muting.....Disabled</td><td>HiLo Airhorn Tones..... Enabled</td></tr><tr><td>PA Ignition Sense.....Disabled</td><td>Manual Tone.....Disabled</td></tr><tr><td>Ext Radio Ignition.....Disabled</td><td>Siren Ignition Sense.....Enabled</td></tr><tr><td>Default PA Volume Level.....13</td><td></td></tr><tr><td>Siren PA After Reset...LAST STATE</td><td></td></tr></table>		Public Address	Siren	Options Audio Muting.....Disabled	HiLo Airhorn Tones..... Enabled	PA Ignition Sense.....Disabled	Manual Tone.....Disabled	Ext Radio Ignition.....Disabled	Siren Ignition Sense.....Enabled	Default PA Volume Level.....13		Siren PA After Reset...LAST STATE	
Public Address	Siren												
Options Audio Muting.....Disabled	HiLo Airhorn Tones..... Enabled												
PA Ignition Sense.....Disabled	Manual Tone.....Disabled												
Ext Radio Ignition.....Disabled	Siren Ignition Sense.....Enabled												
Default PA Volume Level.....13													
Siren PA After Reset...LAST STATE													
F1 HELP	F2	F3	F4	F5	F6	F7	F8	F9	F10 EXIT				

Figure 5-2. "Siren and PA Options" Change Screen

The Siren/PA Options screen allows the user to modify various Siren/PA options (default settings are indicated). The following tables describe the programmable fields and their settings:

Table 5-1. Public Address Fields

Field	Options
Options Audio Muting	Disabled (default) -- Routes all audio to the Public Address speaker when in External Radio Mode. Enabled -- Prevents deciphered SECURENET™ audio and Mobile Voice Storage message playback from being heard over the external speaker. NOTE: This option is not applicable with the Switchbox.
PA Ignition Sense	Disabled (default) -- Public Address operable with ignition switch On or Off. Enabled -- Public Address operable only with ignition switch On.
Ext Radio Ignition	Disabled (default) -- External Radio operable with ignition switch On or Off. Enabled -- External Radio operable only with ignition switch On. NOTE: This option is not applicable with the Switchbox.
Default PA Volume Level	This field is programmed to set the Public Address volume level for initial power-up. If no volume level is manually selected by the operator, the volume will default to whatever level is specified in this field. The range is from 0 to 15 (default 11).
Siren PA After Reset	LAST STATE (default) -- The Siren will power-up in the same state, On or Off, as at power-down (Warm Start). Off -- Siren will always be Off at power-up. NOTE: This option is not applicable with the Switchbox.

Table 5-2. Siren Fields

Field	Options
Hi-Lo Airhorn Tones	Disabled -- Hi-Lo and Airhorn tones cannot be produced. Enabled (default) -- Hi-Lo and/or Airhorn tones are allowed.
Manual Tone	This field selects the Manual Tone that will be heard when the Horn-Ring is pressed. The choices are Ar Hn, Wail, or Yelp (default is Wail).
Siren Ignition Sense	Disabled -- Siren tones operable with the ignition switch On or Off. Enabled (default) -- Siren tones operable with ignition switch On.

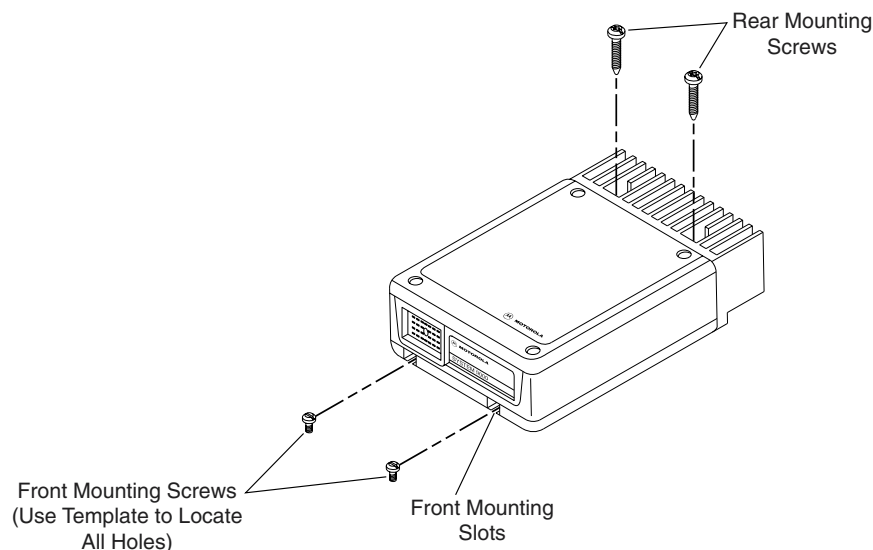
NOTE: Refer to the radio's RSS manual for more detailed information on installing and operating the radio's RSS.

Chapter 6 Installation, Assembly, and Disassembly

6.1 Installation

The Siren/PA should be mounted directly to a flat mounting surface. No mounting tray is required. A template for marking hole locations is in [Chapter 8](#) of this manual. Clearance requirements are indicated on the template drawing, but before marking the hole locations, place the Siren/PA in the intended mounting position to ensure adequate clearance.

1. Choose a location where the mounting screws will not penetrate the gas tank, fuel lines, or other vital parts of the vehicle. The Siren/PA must be mounted on a flat surface using all four mounting screws. The raised shelf in some car trunks makes a good mounting location. The unit should be mounted near the radio, so the cable will reach between the radio and the Siren/PA. Consider the routing of the red power cable and a good location for the black ground lead before selecting a mounting location.
2. Locate and drill four mounting holes according to the location dimensions and hole specifications shown on the template drawing.
3. Install the two front mounting screws, leaving the heads high enough above the mounting surface to permit the screw heads to properly engage in the mounting slots on the front of the Siren/PA (see [Figure 6-1](#)).



MAEPF-26779-O

Figure 6-1. Mounting Slots/Holes

4. Slide the front of the chassis onto the screws, adjusting screw height as necessary.
 5. After the front is properly engaged, install the two rear screws through the holes in the heatsink; tighten the screws.
-

6.2 Cables

The Siren/PA is available with three cable kits, one with a DEK connection, one with a Switchbox connection, and one with neither.

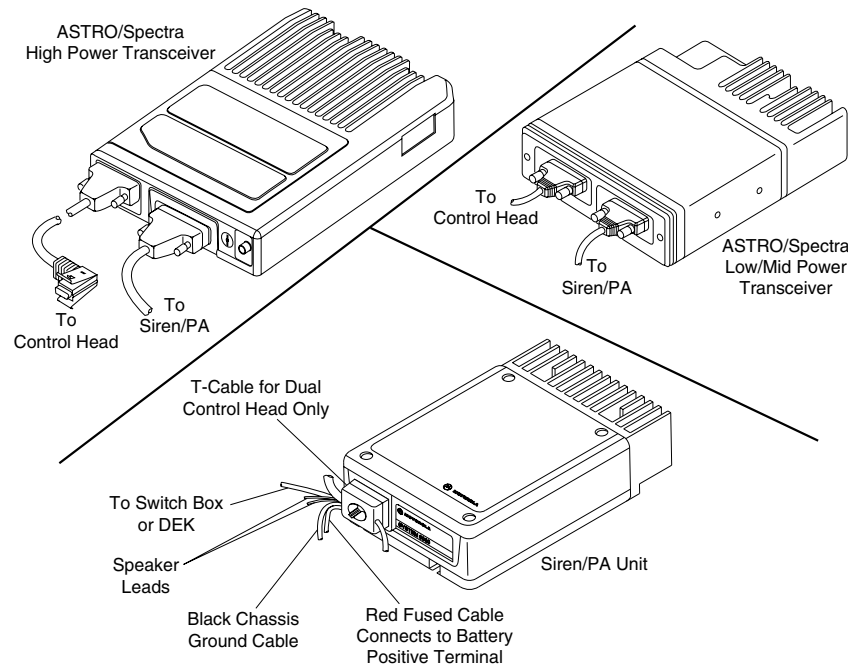


Figure 6-2. Siren/PA Connections

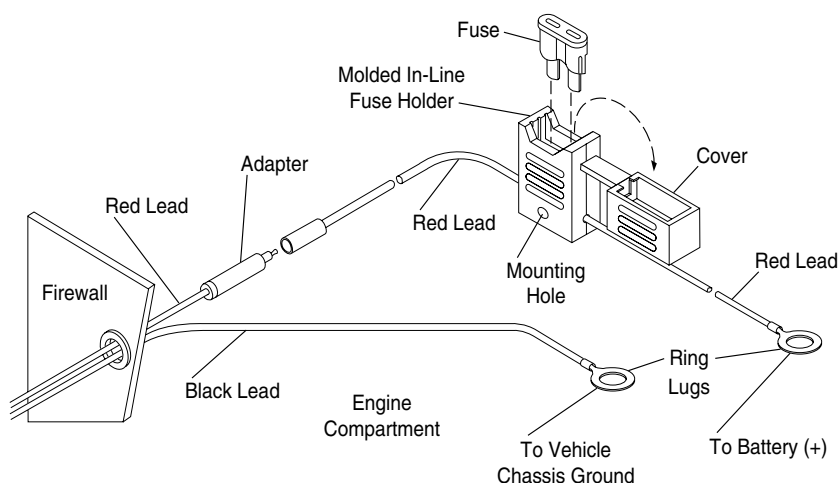
Follow the appropriate steps below for the particular Siren/PA cable.

1. Select the proper Siren power level. The Siren cable ships pre-wired for the 100W power level. For operation at the 65W, 75W, or 130W (dual speaker) levels, you must re-wire the speaker connections inside the connector. Open the connector by peeling back the foam gasket, and removing the 4 screws. Observe that the speaker leads are connected to pin 20 (common) and pin 35 (100W tap). Using a pin removal tool, extract pin 35 and move it to pin location 36 (75W operation) or pin location 28 (65W/130W operation) as appropriate.
2. Route the speaker leads to the speaker location (typically at or near the front of the vehicle) and connect them to the speaker. If dual speakers are used, they must be connected in parallel, and correctly phased. For example, if the speaker terminals are marked + and -, connect the two terminals marked + together, and connect them to one speaker lead. Connect the two terminals marked - together, and connect them to the other speaker lead.

NOTE: It is recommended that the speaker leads not be bundled or tie-wrapped to the radio cable or the control unit cable.

3. Connect the black ground cable to the vehicle chassis. Be sure there is a good ground continuity from the black ground cable to the negative battery cable, as some modern vehicle chassis do not provide optimum electrical connections.
4. Route the red power cable to the vicinity of the battery positive terminal. Be careful to avoid areas where the cable might be subjected to abrasion or high temperatures and use rubber grommets wherever the cable passes through a bulkhead, such as the firewall.

5. Locate the fuse holder as close to the battery as possible and away from any hot engine components. Mount the fuse holder using the provided mounting hole and dress wires as necessary. Connect the fuse holder red adaptor lead plug to the mating receptacle on the red power cable of the Siren/PA unit (see [Figure 6-3](#)).
6. Connect the power cable red lead from the fuse holder to the positive (+) battery terminal.
7. Plug fuse into in-line fuse holder (see [Figure 6-3](#)).



FL08302470

Figure 6-3. Power Cable Assembly

8. Route the radio cable to the radio. Observe that the radio has two connectors on its front panel. The radio control head should be connected to the left connector, and the Siren/PA should be connected to the right connector, facing the radio (See [Figure 6-2](#)).
9. (a) Control unit cable - for units using a DEK - route the cable to the chosen location for the DEK (See [Figure 6-4](#)). Connect the cable to the back of the DEK, being sure the retaining tabs on the connector "click" into engagement with the DEK housing. Fasten the DEK to its trunnion bracket.
- (b) Control unit cable - for units using a Switchbox - route the cable to the chosen location for the Switchbox (See [Figure 6-5](#)). Connect the cable to the back of the Switchbox, and hook the strain relief hook on the cable to the Switchbox strain relief clip. The Switchbox may be mounted either to the supplied bracket, or screwed directly to a suitable surface.

(c) No control unit connection is supplied when the Siren/PA is controlled from the radio control head.

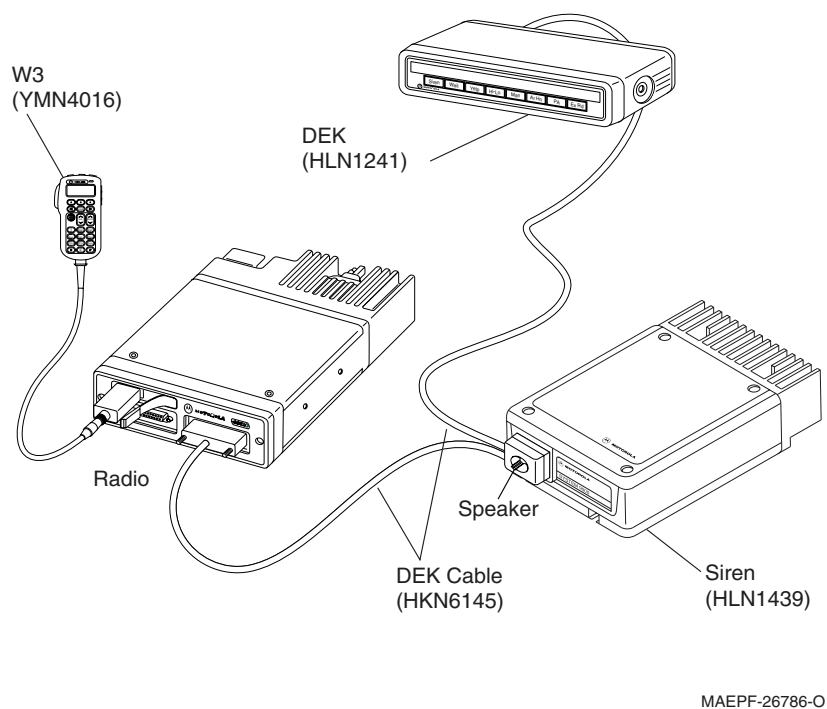


Figure 6-4. Cable Setup -- DEK

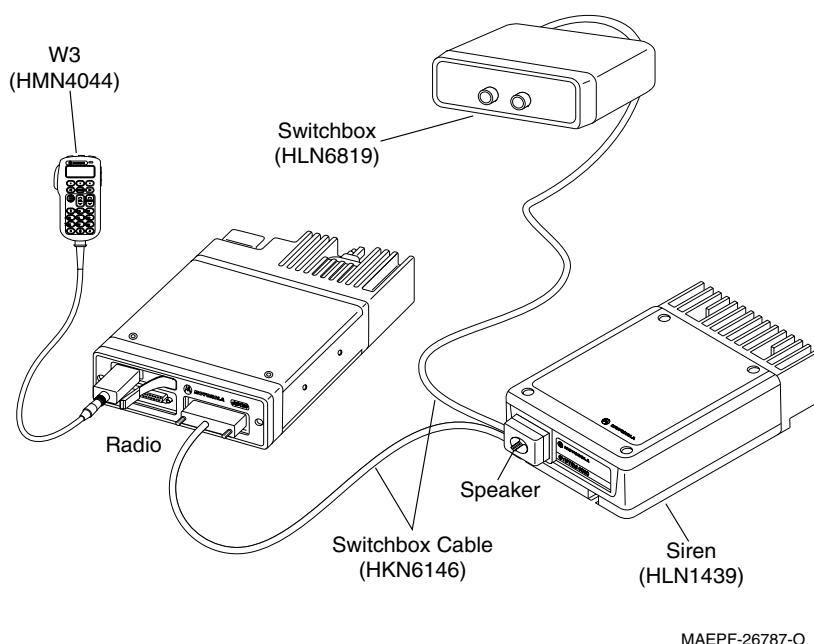


Figure 6-5. Cable Setup -- Switchbox

6.3 Horn-Ring Transfer Relay

In order to make Siren operation more convenient under emergency conditions, the vehicle's Horn-Ring (or buttons) can be used to control Siren functions (refer to [Chapter 2 Operation](#)). This convenience allows the driver to concentrate on road and traffic conditions.

Figure 6-6 shows wiring diagrams for connecting the Horn-Ring via a transfer relay for both negative and positive ground systems. As an alternative, a simple momentary contact pushbutton (normally open) may be installed in the vehicle, in a location convenient to the driver.

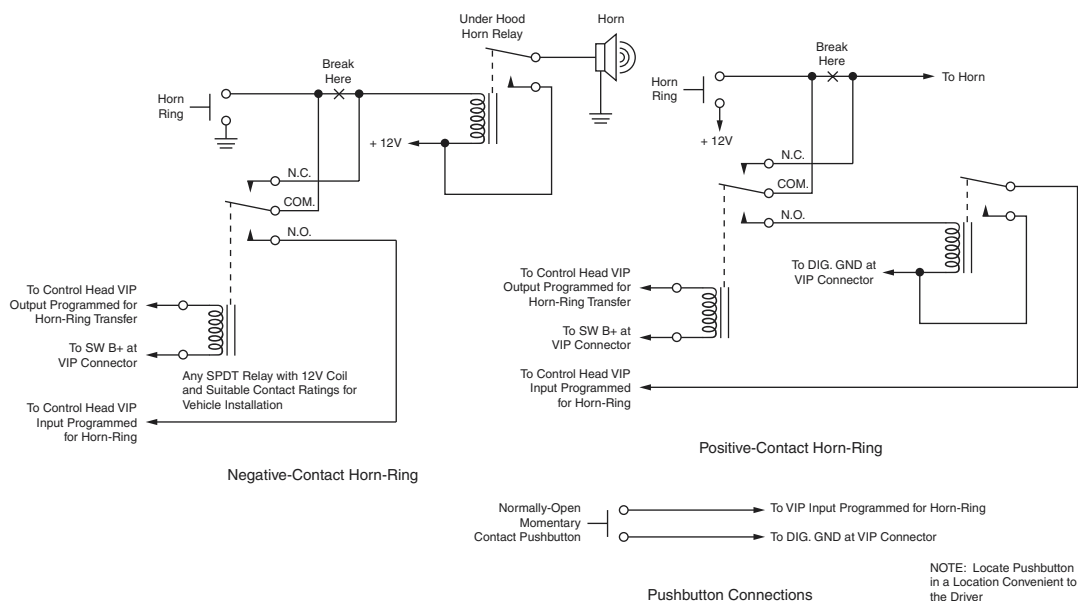


Figure 6-6. Siren/PA Horn-Ring Connections

6.4 Disassembly and Assembly

NOTE: Item numbers in parenthesis () refer to parts identified in [Figure 8-6](#) in [Chapter 8](#) of this manual.

6.4.1 Disassembly

1. Place the Siren/PA on a workbench with the top cover (2) upward. Loosen four screws (1) and remove the top cover (2) from the chassis (8).
2. Remove the component side shield cover (27) by prying the corners from shield fence (28) and lifting upward.
3. Remove the main PC Board as follows:
 - Remove the screw (29) near the connector (11).
 - Remove the screw (12) and bracket (13) that attach the bus assembly (14).
 - Remove two screws (15) from either side of the PC Board (16).
 - Remove seven screws (23) that attach the heatsink to the chassis; remove the heatsink bracket (26).



Use caution when handling the PC board with the heavier heatsink attached. Undue stress could damage the PC board.

Caution

- Move the bus assembly (14) toward the center of the PC board to allow for clearance; slide the PC board/heatsink assembly through the opening at the back of the chassis.
4. Disassemble the PC board/heatsink assembly as follows:
 - Remove the four screws (30) and lock washers (32) from the power transistors. Pull transistor assemblies (25) and (31) away from the casting.
 - Carefully turn the PC board/heatsink over and lay it on a soft protective surface. Remove the two transformer screws (18) and two PC board screws (17). The heatsink (24) can now be removed from the PC board.

6.4.2 Assembly

Reassemble the Siren/PA unit by following the reverse order of disassembly instructions.

NOTE: When installing the PC board/heatsink assembly, be sure the gasket between the connector and the chassis wall is properly seated so that the integrity of the environmental seal is not jeopardized.

6.5 Pushbutton Removal and Replacement

The DEK is assembled with all the pushbuttons for standard features and for options specified at the time of the initial customer order. If an option is requested after the initial order is placed, the button with the correct graphic symbol may need to be installed in the field. Install pushbuttons as follows:

1. Check the operator manual for the correct button location.
2. If another pushbutton (or plug key) is in that location, use pliers to squeeze the button or plug and gently pull it from the DEK.
3. Insert the new pushbutton by placing it into the slot (with the graphic symbol oriented correctly) and press down gently until it snaps into place. If it does not immediately seat, again press the button, as if actuating the feature, until the button self-aligns.

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Chapter 7 Maintenance and Troubleshooting

7.1 Overview

Refer to [Table 1-2](#) at the beginning of this manual to determine the minimum specifications a properly functioning Siren/PA should meet. All tests should be conducted at 13.8Vdc supply, with an 11ohm resistive load, unless otherwise noted.

7.2 Maintenance

7.2.1 Public Address Input Sensitivity Test

1. Turn the Public Address on.
2. Input an 80mV RMS, 1kHz test signal to the Mic input (with PTT pressed) and adjust PA volume to max (hold volume rocker on control head down until display indicates "PA VOL 15"). The unit under test must generate at least 50W RMS output into an 11ohm load (or 23.5V RMS).
3. Adjust the volume to obtain 50W (or as close to, but not less than 50W, as possible).
4. Measure the distortion across the 11ohm load.
5. Measure the supply current drawn by the Siren/PA.

7.2.2 Frequency Response Test

1. Turn the Public Address on, and input an 80mV RMS, 1 kHz signal to the Mic input (with PTT pressed).
2. Adjust the PA volume to obtain approximately 16V RMS into an 11 ohm load.
3. Set the input signal for 80mV RMS at 200 Hz. Verify the output level is within +/- 3dB of the original value.
4. Set the input signal for 80mV RMS at 8kHz. Verify the output level is within +/- 3dB of the original value.
5. Set the input signal for 80mV RMS at 9kHz. Verify the output level is within +/- 4dB of the original value.
6. Set the input signal for 80mV RMS at 10kHz. Verify the output level is within +/- 4dB of the original value.

7.2.3 Siren Output Power Test

1. Select any Siren tone, and turn the Siren on.
2. Measure the output voltage across an 11ohm load with a true RMS voltmeter, and calculate the power level.

NOTE: Many voltmeters do not read RMS voltage correctly for very square waveforms such as the Siren output. As an alternative, select the HI-LO Siren tone, and measure the peak-to-peak voltage using an oscilloscope. A peak-to-peak voltage greater than 70V corresponds to 100W RMS.

3. Measure the supply current drawn by the Siren.
-

7.2.4 Siren Power Control Test

1. With the Siren on, as in the previous step, increase the supply voltage to 16.6Vdc.
2. Measure the output voltage across an 11ohm load with a true RMS voltmeter, and calculate the power level. This power value should be within 10% of the value from the preceding step.

NOTE: Many voltmeters do not read RMS voltage correctly for very square waveforms, such as the Siren output. Unfortunately, the Siren regulates power at high supply voltage by changing the waveform, thus there is no simple alternative.

3. Measure the supply current drawn by the Siren.

7.2.5 Speaker Short Circuit Protection Test

1. Select any Siren tone and turn the Siren on.
2. Short the speaker leads together. The control head should display "SPKR SHORT". The Siren tone will cycle off and on.
3. Measure the supply current.
4. Remove the speaker short. The Siren should return to normal operation.

7.2.6 Operating Mode Retention Test

1. Select any Siren tone and turn the Siren on. Note which tone is active.
2. Turn the radio power switch on the control head off. Note the Siren turns off, and supply current drops to a low value.
3. Turn the radio power switch back on.
4. Note the Siren is off, but when the Siren is turned on, the previously active tone is again active.

Chapter 8 Siren/PA Schematics and Circuit Boards

The following table lists the schematics and diagrams contained in this chapter for your reference.

Figure Title	Page #
ASTRO Siren/PA Mounting Template	8-2
HLN6812B ASTRO Siren/PA Circuit Board Overlay/ Component View	8-3
HLN6812B ASTRO Siren/PA Printed Circuit Board Schematic Diagram Sheet 1 of 3	8-4
HLN6812B ASTRO Siren/PA Printed Circuit Board Schematic Diagram Sheet 2 of 3	8-5
HLN6812B ASTRO Siren/PA Circuit Board Schematic Diagram Sheet 3 of 3	8-6
ASTRO Siren/PA Accessory Exploded View and Exploded View Parts List	8-9

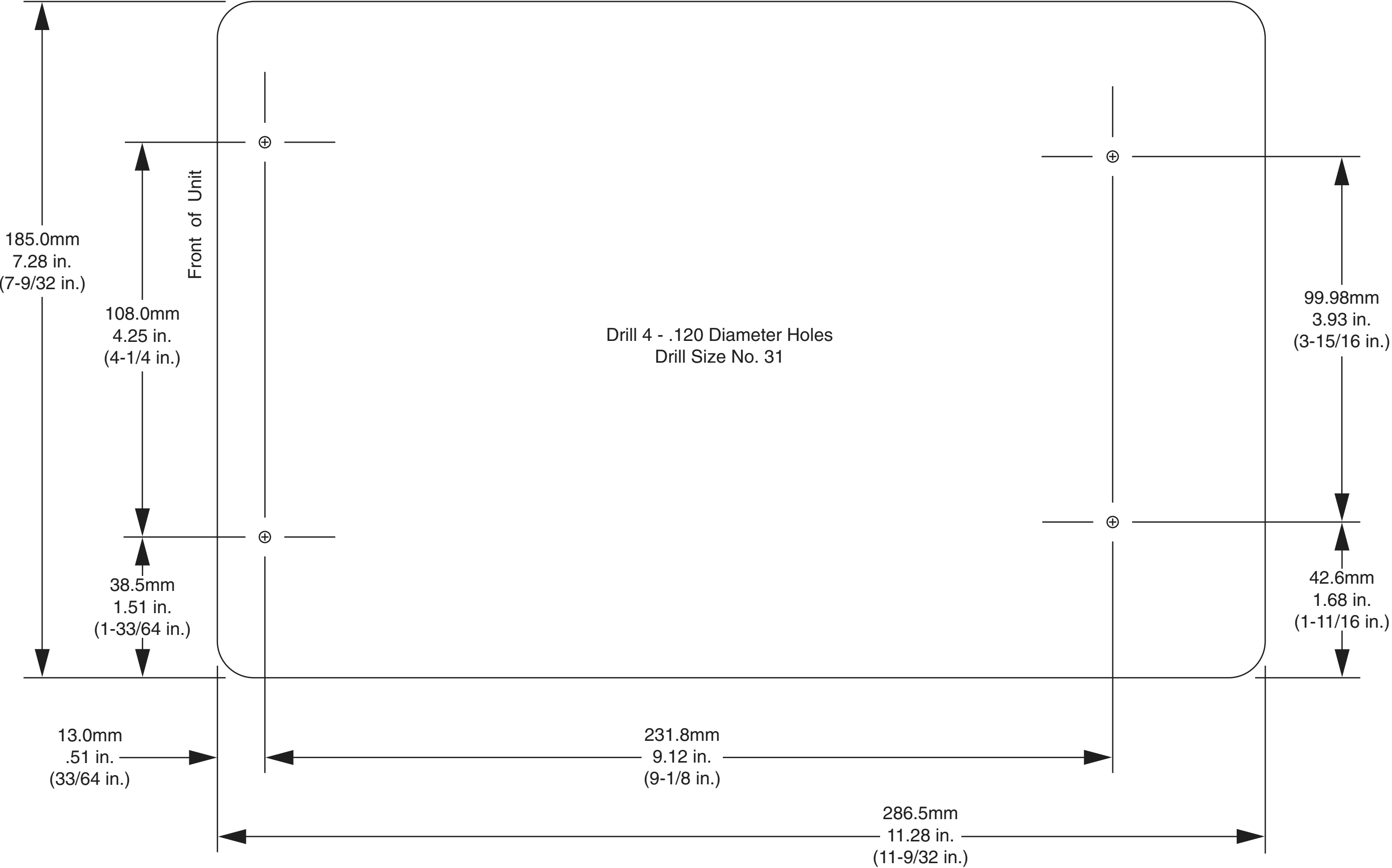


Figure 8-1: ASTRO Siren/PA Mounting Template



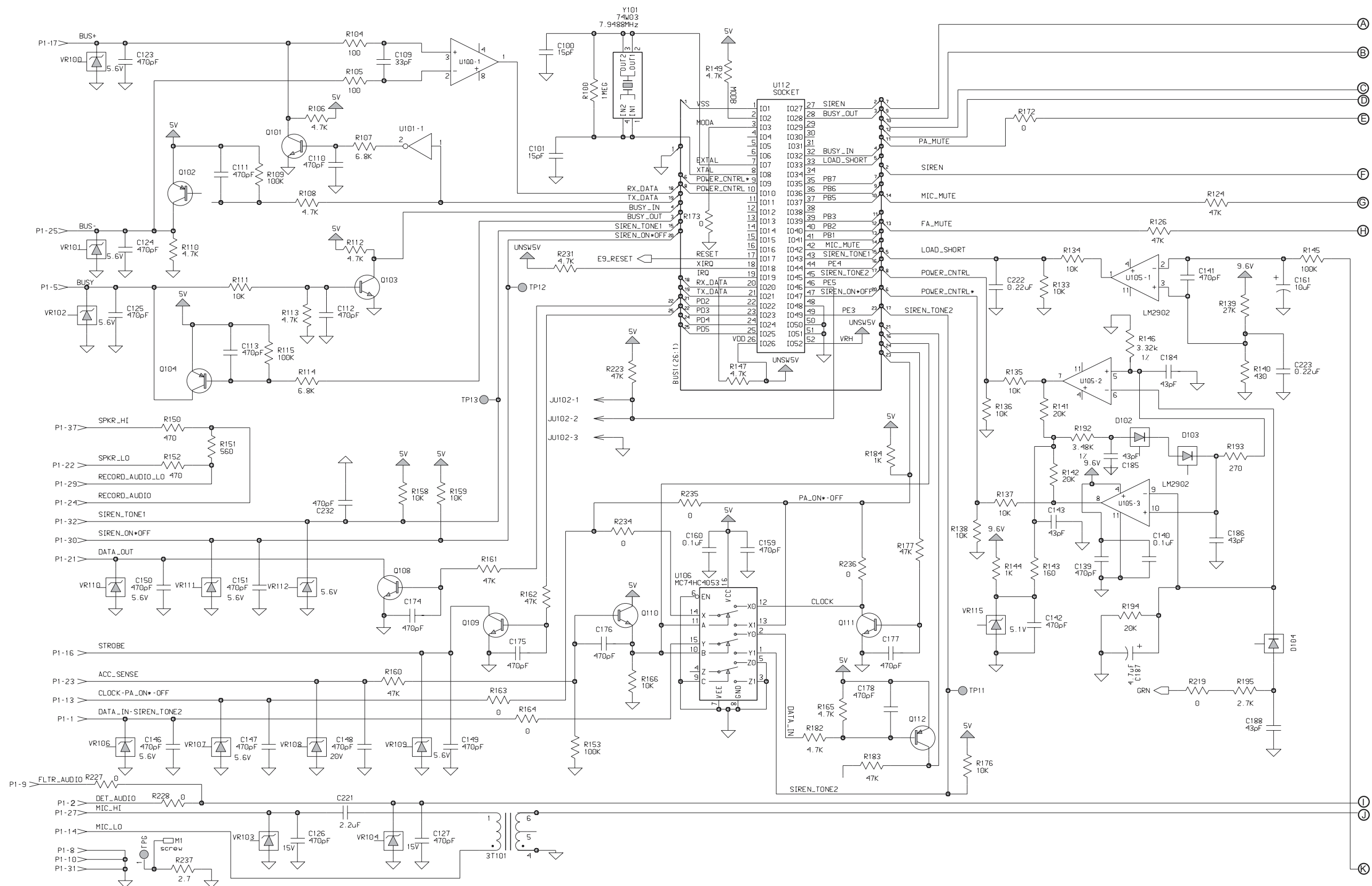
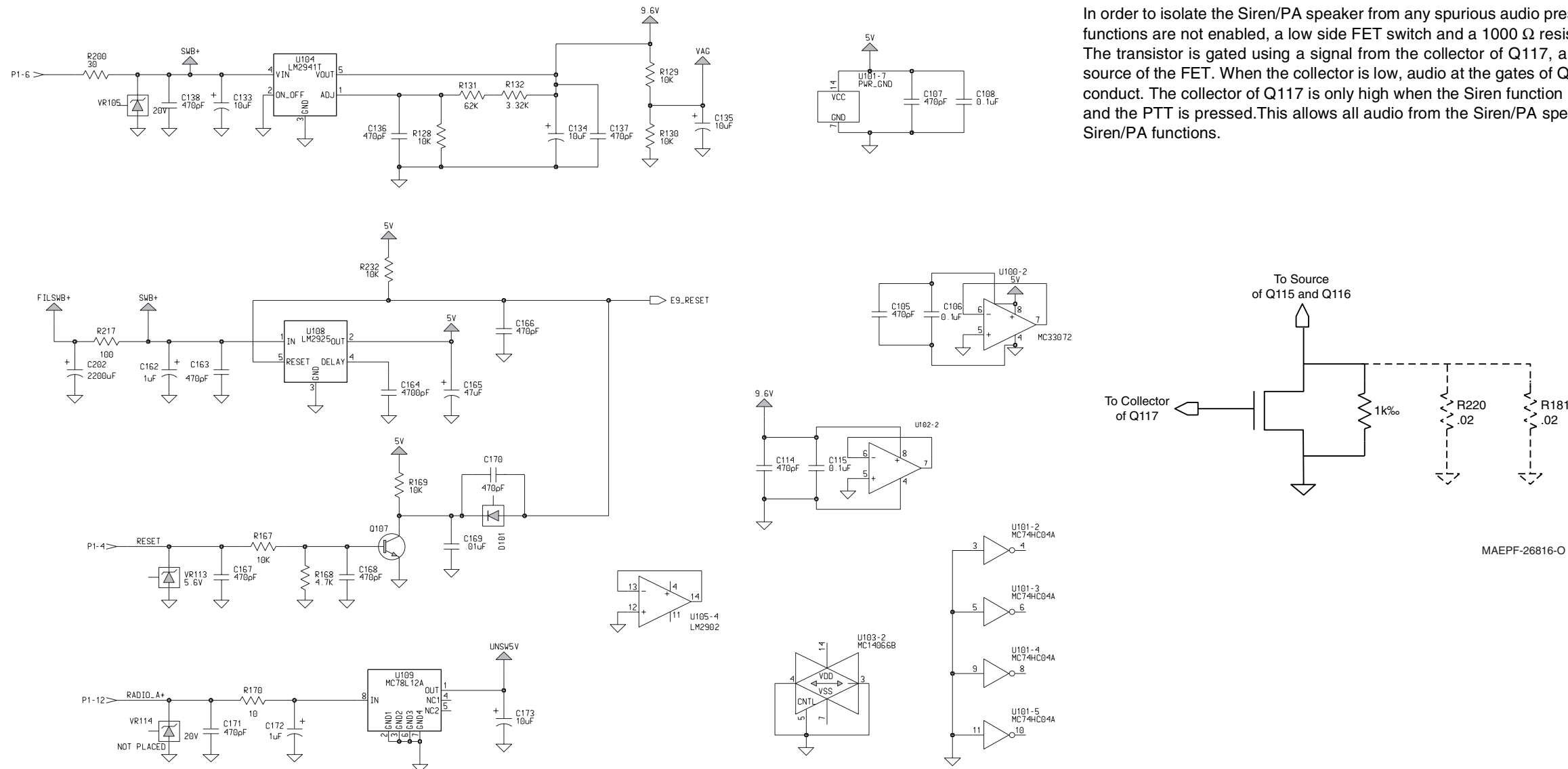


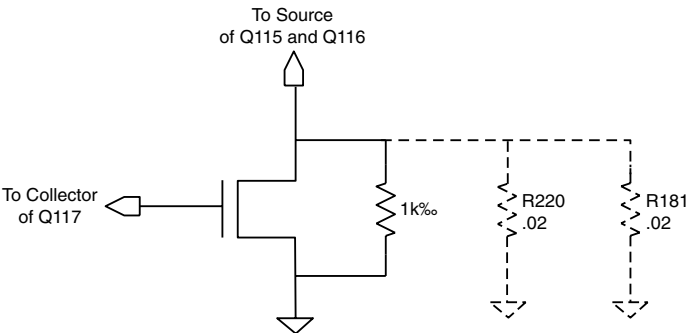
Figure 8-3: HLN6812B ASTRO Siren/PA Printed Circuit Board Schematic Diagram Sheet 1 of 3





Additional Circuitry for Siren/PA Audio Muting Capability:

In order to isolate the Siren/PA speaker from any spurious audio present in the amplifier stages when the Siren/PA functions are not enabled, a low side FET switch and a 1000 Ω resistor were inserted in place of R181 and R220. The transistor is gated using a signal from the collector of Q117, and the resistor is placed from the drain to the source of the FET. When the collector is low, audio at the gates of Q115 and Q116 will not cause the transistors to conduct. The collector of Q117 is only high when the Siren function is enabled or when the PA function is enabled and the PTT is pressed. This allows all audio from the Siren/PA speaker to be controlled by the user enabling the Siren/PA functions.



Dashed line indicates that R220 and R181 are no longer present.

Figure 8-5: HLN6812B ASTRO Siren/PA Circuit Board Schematic Diagram Sheet 3 of 3

Printed Circuit Board Electrical Parts list

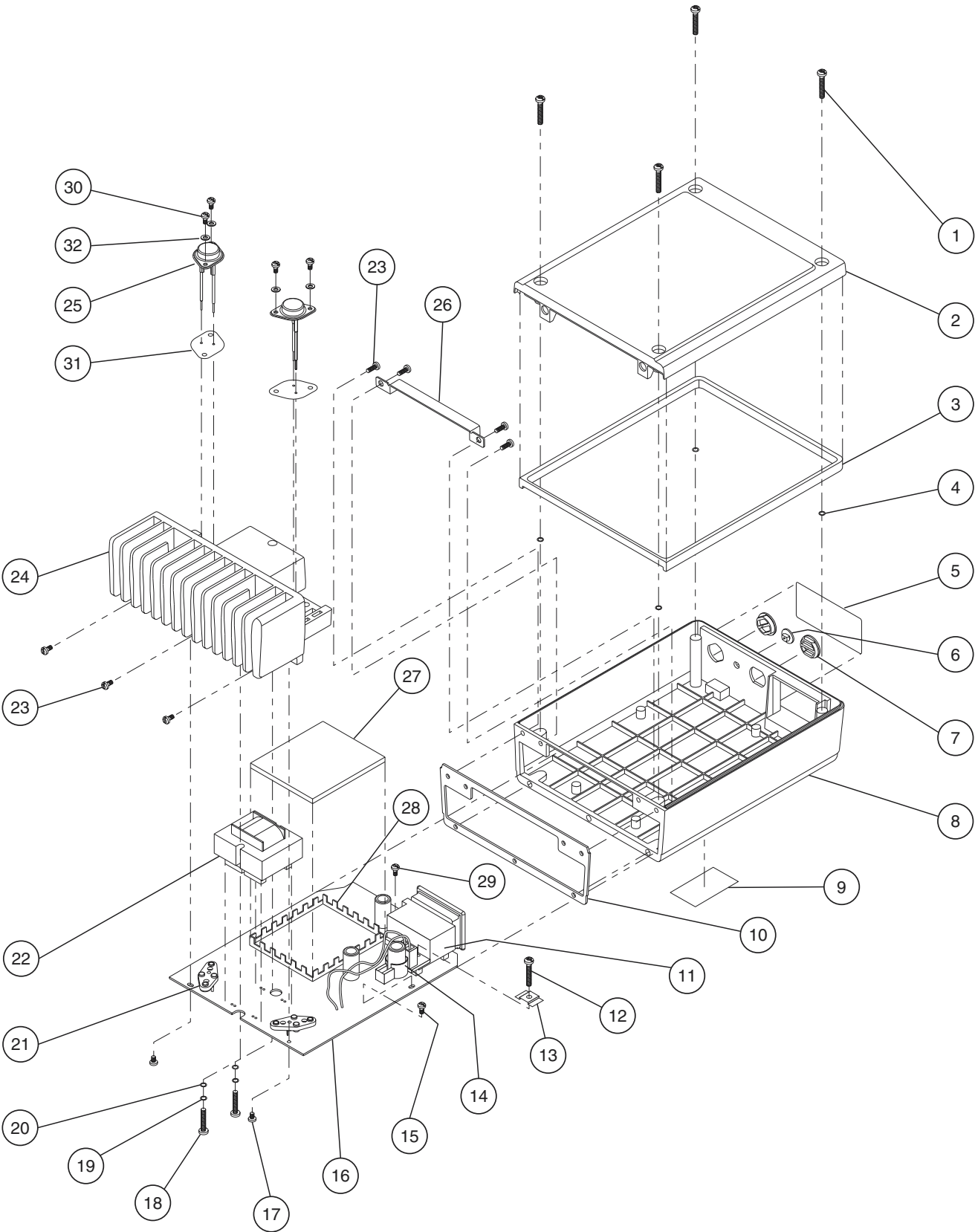
Part No	QTY	Reference DES	Description
	1	----	PCB
0180742T06	1	P1	CONN SIREN FRONT ASSY
2313748E31	1	C202	CAP 2200uF
2360561M85	1	C199	CAP 3300uF
2113741U17	2	C181	CAP 0.1uF
		C215	
2113740F59	1	C154	CAP 220pF
2113740R71	4	C206, C208	CAP 470pF
		C207, C209	
2113743B29	4	C179, C200	CAP 1uF
2113743G24	2	C128, C221	CAP 2.2uF
2113741F41	1	C164	CAP 4700pF
2113740F39	1	C109	CAP 33pF
2113740F42	5	C143, C186	CAP 43pF
		C184, C188	
		C185	
2113740F67	55	C104, C151	CAP 470pF
		C105, C153	
		C107, C155	
		C110, C159	
		C111, C174	
		C112, C175	
		C113, C176	
		C114, C177	
		C117, C178	
		C119, C182	
		C121, C197	
		C122, C210	
		C123, C211	
		C124, C212	
		C125, C213	
		C126, C214	
		C127, C224	
		C136, C225	
		C137, C226	

Part No	QTY	Reference DES	Description
		C138, C227	
		C139, C163	
		C141, C166	
		C142, C167	
		C146, C168	
		C147, C170	
		C148, C171	
		C149, C232	
		C150	
2113741F49	4	C169, C219	CAP 0 .01uF
		C217, C220	
2113743E20	10	C106, C156	CAP 0 .1uF
		C108, C160	
		C115, C129	
		C120, C229	
		C140, C231	
2113743F14	2	C131, C132	CAP 0.47uF
2113743K16	3	C116, C223	CAP 0.22uF
		C222	
2113740F31	2	C100, C101	CAP 15pF
2113743A27	1	C183	CAP 0.47uF
2311049A08	3	C118, C172	CAP 1uF
		C162	
2311049A14	2	C103, C187	CAP 4.7uF
2311049A19	5	C133, C161	CAP 10uF
		C134, C173	
		C135	
2311049A23	1	C165	CAP 47uF
2311049A09	3	C195, C203	CAP 2.2uF
		C196	
2311049A05	1	C230	CAP 0.47uF
2880001R03	3	JU100, JU102	JUMPER
		JU101	
3910184A10	2	-----	T100 STRIP PLUG
0985348C01	3	-----	MOVABLE JUMPER
0985440C01	4	-----	XSTOR CONTACTS
4885311C01	2	Q115, Q116	XSTOR

Part No	QTY	Reference DES	Description
0980049R04	1	U112	SKT 52-P
4805574W03	1	Y101	XTAL 7.9488MHZ
5105625U25	1	U104	IC LM2941
0105957T74	1	-----	PROGRAMMED uP
5113816A03	1	U109	IC 78L05
5113805A04	1	U101	IC 74HC04
5113806A21	1	U103	IC 4066
5113819A02	1	U105	IC LM2902
5113805A85	1	U106	IC 74HC4053
5113818A03	2	U100, U102	IC MC33072
5113819A05	1	U107	IC MC33074
5185353D18	1	U111	IC X9C303V8T2
5105625U24	1	U108	IC CS8126-1
0662057B47	10	R172, R234	RES 0
		R173, R235	
		R163, R236	
		R164, R227	
		R219, R228	
0662057A65	12	R106, R149	RES 4.7K
		R108, R165	
		R110, R168	
		R112, R182	
		R113, R226	
		R147, R231	
0662057A49	6	R117, R212	RES 1K
		R144, R214	
		R154, R184	
0662057A73	26	R111, R159	RES 10K
		R116, R166	
		R121, R167	
		R128, R169	
		R129, R176	
		R130, R178	
		R133, R185	
		R134, R232	
		R135, R186	
		R136, R209	

Part No	QTY	Reference DES	Description
		R137, R215	
		R138, R158	
		R157	
0662057A80	4	R101, R142	RES 20K
		R141, R194	
0662057A81	2	R125, R127	RES 22K
0662057A85	2	R102, R119	RES 33K
0662057A97	7	R109, R145	RES 100K
		R115, R238	
		R153, R241	
		R118	
0662057B22	1	R100	RES 1M
0662057A35	3	R193, R211	RES 270
		R210	
0662057A01	2	R170, R191	RES 10
0662057A89	12	R103, R162	RES 47K
		R124, R177	
		R126, R183	
		R155, R223	
		R160, R224	
		R161, R225	
0662057A25	3	R104, R217	RES 100
		R105	
0662057A30	1	R143	RES 160
0662057A69	2	R107, R114	RES 6.8K
0662057A60	1	R120	RES 3K
0660257A76	1	R122	RES 13K
0662057A92	1	R131, R190	RES 62K
0662057A98	1	R239	RES 110K
0662057A79	1	R206	RES 18K
0662057A40	1	R140	RES 430R0
0662057A90	1	R240	RES 51K
0662057A59	2	R179, R195	RES 2.7K
0662057A83	2	R139, R196	RES 27K
0662057A12	1	R200	RES 30
0662057T59	2	R146, R132	RES 3.32K
0662057Z44	1	R192	RES 3.48K

Part No	QTY	Reference DES	Description
0680195M43	1	R151	RES 560
0680195M41	2	R150, R152	RES 470
0680195M49	1	R220	RES 1K
0680194M52	3	R216, R237	RES 2.7
		R218	
0680194M08	2	R189, R222	RES 20
4813824A18	3	Q102, Q112	XSTOR 2N4403
		Q104	
4880141L02	1	Q107	XSTOR 2N3904
4813824A12	10	Q100, Q108	XSTOR 2N4401
		Q101, Q109	
		Q103, Q110	
		Q105, Q111	
		Q106, Q117	
4813833C10	4	D101, D103	XSTOR MBD6050
		D102, D104	
4880140L25	3	VR105, VR114	DIODE ZENER 20V
		VR108	
4813821A42	1	Q118	XSTOR
4880140L07	10	VR100, VR109	DIODE 5.6V
		VR101, VR110	
		VR102, VR111	
		VR106, VR112	
		VR107, VR113	
4813830A14	1	VR115	DIODE ZENER 5.1V
4813825A08	1	D100	DIODE MMBD701
4813830A28	2	VR103, VR104	DIODE ZENER 15V
2584422T01	1	T101	XFMR
	1	SH1	FENCE



ASTRO Spectra Siren/PA Accessory Exploded View Parts List

ITEM NO.	MOTOROLA PART NUMBER	DESCRIPTION
1	0310908B04	Machine Screw (4X0.7X25) (4 used)
2	1580120K01	Top Cover
3	3280123K01	Chassis Cover Seal
4	4210128A08	Rubber Retaining Ring (4 used)
5	1380124K03	Escutcheon
6	3880231K01	Single D Plug
7	3880232K01	Double D Plug (2 used)
8	2780121K01	Siren/PA Chassis
9	3380178M02	Nameplate
10	3280122K01	Chassis Heat Sink Seal
11	0180742T06	Front Connector
12	0310908A24	Machine Screw (3X0.5X25) (1 per)
13	0780044L01	Interconnect Bracket
14	0180752T42	Buss Boss Assembly
15	0310908A19	Machine Screw (3X0.5X8) (2 used)
16	HLN6812B	PC Board Assembly (includes 11, 14, 21, 22, 27, 28)
17	0310908A22	Machine Screw (3X0.5X16) (2 used)
18	0310908A41	Machine Screw (4X0.7X30) (2 used)
19	0400007651	Lock Washer (2 per)
20	0400001720	Flat Washer (2 per)
21	0985308C01	Modified Transister Socket (2)
22	2580112K01	Transformer
23	0310920A25	Cap Screw (4X0.7X10) (7 per)
24	2680119K01	Siren/PA Heat Sink
25	4885311C01	Transistor (2 per)
26	0780003L01	Chassis Heat Sink Bracket
27	2605455Z04	Shield Cover
28		Shield Fence
29	0310908A23	Screw Machine (3X0.5X20) (1 per))
30	0300007342	Machine screw (6-32x5/8) (4 used)
31	1480289K01	Insulator (2 used)
32	0400002645	Lock washer (4 used)

Figure 8-6: ASTRO Siren/PA Accessory Exploded View and Exploded View Parts List

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REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Crystal orders should specify the crystal type number, crystal and carrier frequency, and the model number in which the part is used.

MAIL ORDERS

Send written orders to the following addresses:

Replacement Parts/
Test Equipment/Manuals/
Crystal Service Items:
Motorola Inc.
United States and Canada
Accessories and Aftermarket
Division
Attention: Order Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

Federal Government Orders:
Motorola Inc.
United States and Canada
Accessories and Aftermarket
Division
Attention: Order Processing
7230 Parkway Drive
Landover, MD 21076

International Orders:
Motorola Inc.
United States and Canada
Accessories and Aftermarket
Division
Attention: International Order
Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

TELEPHONE ORDERS

United States and Canada Accessories and Aftermarket Division:
Call: 1-800-422-4210
1-800-826-1913 (For Federal Government Orders)
1-847-538-8023 (International Orders)

Servicers Training (VHS Video Tapes):
Call: 847-783-2522
847-783-2523 (FAX)

FAX ORDERS

United States and Canada Accessories and Aftermarket Division:
FAX: 847-538-8198 (Domestic)
847-576-3023 (International)
Parts ID:847-538-8194

Federal Government Orders:
FAX: 410-712-4991
International:410-712-6200

PARTS CUSTOMER SERVICE

United States and Canada Accessories and Aftermarket
Division:
Call: 1-800-422-4210
Parts Identification:
Call: 847-538-0021

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Customer Response Center
(Sales and Service Assistance):
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FAX: 1-800-232-9272



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